Evaluation of Herbicides Identified for Use in Coca Eradication in Colombia

The United States Environmental Protection Agency (EPA) requires substantial amounts of toxicology and exposure data to be collected and submitted for pesticide registration. For example, numerous studies in laboratory animals are conducted on pesticides on a variety of effects such as cancer and systemic toxicity. The Food Quality Protection Act (FQPA) requires specific consideration of the potential for infants and children to be sensitive to pesticides. Accordingly, EPA requires testing on developmental toxicity and reproductive toxicity and often specific evaluations on brain development. Multiple species are tested, namely rats, mice, dogs, rabbits, birds, fish, plants, bees and other insects. These tests range in their duration of exposure from a single day up to the entire lifetime of the laboratory animal and are conducted in different routes of exposure (oral, dermal, inhalation).

With respect to the information provided in Table 1, the EPA notes the following:

- The Reference Dose (RfD) is EPA's toxicity level used to evaluate risk to pesticides. RfDs are developed using laboratory animals and using uncertainty factors. Smaller RfD values are found for more toxic pesticides. Larger values are developed for less toxic ones.

- Soil half-life is a measure of how long a pesticide stays in the soil. Triclopyr and glufosinate have the shortest soil half-lives (up to 23 days) while imazapyr and paraquat have longer half-lives (approximately 6 and >10 years, respectively).

- Effects from a single dose were observed for glufosinate, triclopyr, and paraquat, but not for the metsulfuron-methyl, imazapyr, aminopyralid, and glyphosate.

- Paraquat causes lung effects through oral and inhalation routes at low doses. Without proper protective equipment, deaths can occur from paraquat exposure.

- Effects were only seen at high doses for glyphosate and imazapyr; however, imazapyr may not be as effective as glyphosate for the intended use in Colombia.

- Glyphosate is considered to have little to no hazard when exposure is to the skin and when it is inhaled. Effects in laboratory animals were only seen through ingestion at high doses.

- All of the chemicals are considered not likely to be carcinogenic to humans, except triclopyr which showed a marginal increase in tumor responses.

Herbicide Common Name	Trade Name	Human Health			Ecological
		Acute Endpoints and Effects (active ingredient)	Chronic Oral Endpoints and Effects (active ingredient)	Carcinogenic risk (active ingredient)	Soil ½ -life (active ingredient)
Metsulfuron-methyl	[HYPERLINK "http://npic.orst.edu/NPRO/product.s?co=432&prod=1549&dist=0"] from Bayer (product page links to EPA label)	No effects identified from a single dose	Chronic RfD = 0.25 mg/kg/day endpoints are based on body weight changes	Not likely to be carcinogenic to humans	Up to 240 days
Imazapyr	[HYPERLINK "http://npic.orst.edu/NPRO/product.s?co=241&prod=387&dist=0"] from BASF (product page links to EPA label)	No effects identified from a single dose	A chronic endpoint was not selected based on lack of adverse effects at human relevant doses	Not likely to be carcinogenic to humans	Up to 5.9 years
Aminopyralid potassium salt and Metsulfuron Methyl	Mazo from Dow AgroSciences **(Not registered in the US)**	No effects identified from a single dose	Aminopyralid: Chronic RfD = 0.5 mg/kg/day based on effects in cecum and decreased body weight Metsulfuron-methyl: See above	Not likely to be carcinogenic to humans	Up to 148 days

Herbicide Common Name	Trade Name	Human Health			Ecological
		Acute Endpoints and Effects (active ingredient)	Chronic Oral Endpoints and Effects (active ingredient)	Carcinogenic risk (active ingredient)	Soil ½ -life (active ingredient)
Glufosinate ammonium	* (Glufosinate ammonium Ranbow) Glufosinato de Amonio Ranbow from Rainbow Agroscience * Zulu Sl from AGROSER S.A *Antorch Interoc 200g/l from INTEROC S.A *Destierro Sl from INVESA S.A *(Glufosinate ammonium 200 S DVAl) Glufosinato de amonio 200 Sl DVA from DVA de Colombia Ltda *Glufosam 150 Sl from Sharda Colombia S.A. *Evostar EVOFARMS® 200 SL from UPL Colombia *Rango 150 Sl from PHYTOCARE S.A *[HYPERLINK "http://npic.orst.edu/NPRO/product.s?co=264&prod=829&dist=0"] from Bayer CropScience *ZIBO 200Sl from ROTAM AGRO **(Only Liberty is registered in the US; product page links to EPA label)**	aRfD (Females 13-49 years old) = 0.063 mg/kg/day based on increased fetal deaths No effects identified from a single dose for general population	Chronic RfD = 0.006 mg/kg/day based on effects in the brain and heart, as well as increased mortality	Not likely to be carcinogenic to humans	Up to 23 days
Triclopyr	[HYPERLINK "http://npic.orst.edu/NPRO/product.s?co=62719&prod=553&dist=0"] from Dow AgroSciences (product page links to EPA label)	aRfD (all populations) = 1.0 mg/kg/day based on increased mortality aRfD (females 13-49 years old) = 0.05 mg/kg/day based on increased incidence of rare malformations in offspring	cRfD = 0.05 mg/kg/day based on effects in thekidney	Marginal tumor responses in mice and rats	Up to 18 days

Herbicide Common Name	Trade Name	Human Health			Ecological
		Acute Endpoints and Effects (active ingredient)	Chronic Oral Endpoints and Effects (active ingredient)	Carcinogenic risk (active ingredient)	Soil ½ -life (active ingredient)
Glyphosate	Cuspide 480 Sl From Talanu Chemical **(Not registered in the US)**	No effects identified from a single dose	cRfD = 1.0 mg/kg/day based on clinical signs (diarrhea, reduced feces)	Not likely to be carcinogenic to humans	Up to 77.1 days
Paraquat Dichloride	[HYPERLINK "http://npic.orst.edu/NPRO/product.s?co=100&prod=1431&dist=0"] from Syngenta (product page links to EPA label)	aRfD (all populations) = 0.0125 mg/kg/day based on effects in the lung	cRfD = 0.005 based on effects in the lung	Not likely to be carcinogenic to humans	Stable (>10 years)

Sources

Human Health

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- Glufosinate Ammonium, Updated Human Health Risk Assessment for the Proposed New Use of Glufosinate Ammonium in/on Citrus Fruit (Crop Group 10), Pome Fruit (Crop Group 11), Stone Fruit (Crop Group 12), Olives and Sweet Corn, dated July 25, 2012 (D406360): [HYPERLINK "https://www.regulations.gov/document?D=EPA-HQ-OPP-2009-0813-0005"]
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Ecological

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- Glufosinate 2014 PRA risk assessment: [HYPERLINK "https://www.regulations.gov/document?D=EPA-HQ-OPP-2008-0190-0049"]

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    - [HYPERLINK "https://nepis.epa.gov/Exe/ZyNET.exe/20000PDW.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1995+Thru+1999&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C95thru99%5CTxt%5C00000011%5C20000PDW.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL"]
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